# Update on Advanced Secondary Armament System (SAS)

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***Providing America Advanced Armaments for Peace and War***

# *Industry Partners*

TECHNO-SCIENCES

- **Prime contractor**
- **System modeling**
- **Interfaces**
- **Control systems**

GENERAL DYNAMICS
Robotic Systems

- **Electrical and mechanical design**
- **Power systems**
- **Hardware fabrication**

GENERAL DYNAMICS
Armament and Technical Products

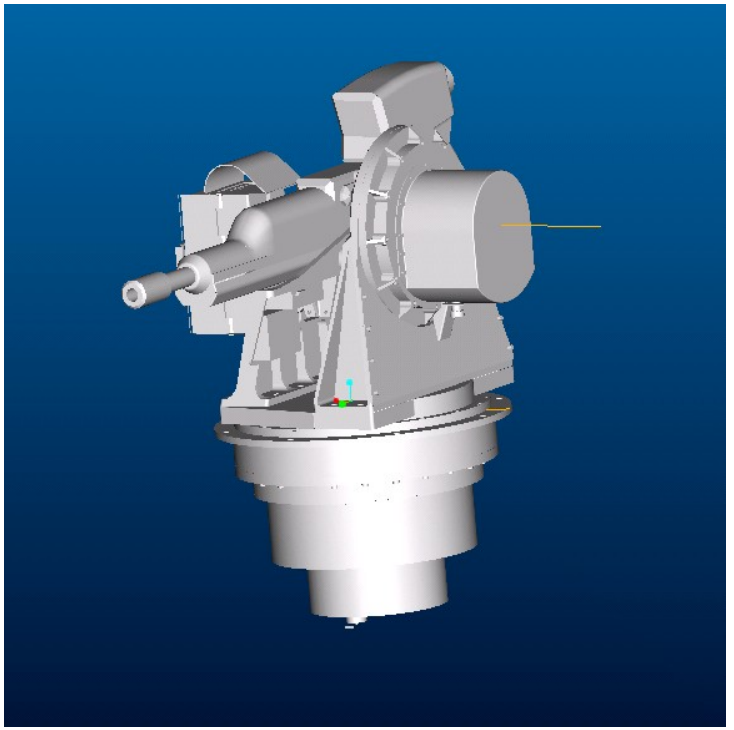
- **Weapon integration**
- **Fire control integration**
- **Mechanical design**

# Background

- Originally intended to be integrated onto Multi-Role Armaments and Ammunition (MRAAS) ATD Turret Mission Module (TMM)
  - Use TMM controls
  - Ethernet based interface
  - TMM system integration lab (SIL)
- MRAAS was restructured and renamed 120mm Line of Sight/Beyond Line of Sight (LOS/BLOS) ATD
  - Stand alone demo SAS
  - Develop own controls and displays
  - Integrate on Stryker vehicle

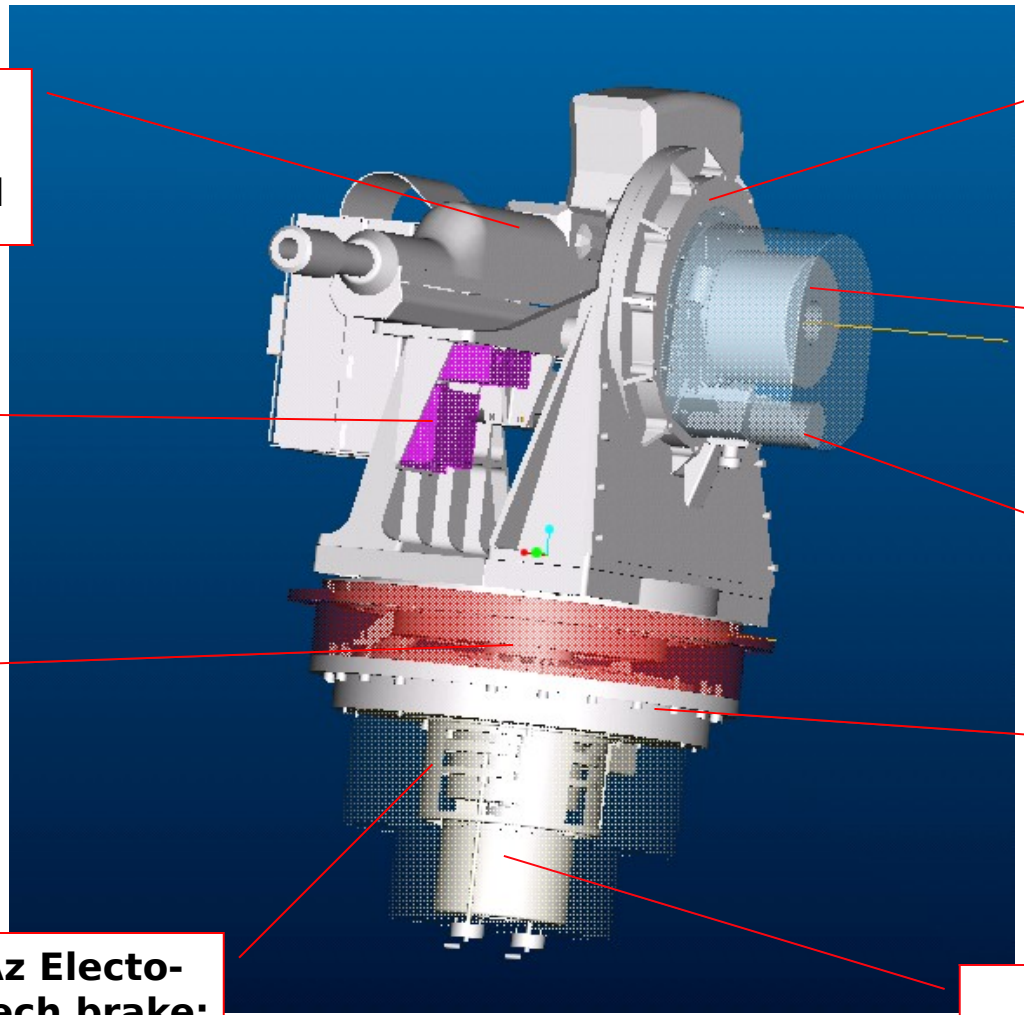
# ATD Secondary Armament System (SAS) Design Concept

- Segmented Electro-Magnetic Array (SEMA) elevation and azimuth motors
- XM307 Objective Crew Served Weapon
  - Fire control provides sighting and ballistic solution
- Meet objective rates of 500 deg/s AZ and 240 deg/s EL
- Elevation and depression of +55-deg and -20 deg, respectively vs goal of 60 deg
- Cut foot print from 24 to 22 inches
- Height from platform interface to top of fire control <25 inches
- Baseline weight of 530 lb
  - Includes 31 rounds in ready box
- ATD to use OCSW ammo box for proof of concept fire testing



# Major Components

**XM307 Advanced Crew Served Weapon**



**El Motor:** 208 ft-lb max torque

**El Encoder:** 200K/turn resolution

**El Lock**

**Hi-perf Fiber Optic Gyros**

**Slip Ring:**
4 power
8 relays
50 sig cir

**Az Motor:** 500 ft-lb max torque

**Az Electo-mech brake:** 72 ft-lb torque

*Source: GD Rototic Systems*

**Az Encoder:** 200K/turn resolution

# Segmented Electro-Magnetic Array (SEMA) Motors

- **Zero backlash/no mechanical wear**
- **High mechanical stiffness**
- **High torque achievable at high, low, and zero rpm**
- **Power efficient with regenerative power capabilities**
- **High position resolution**

*© Lynx Motion Technology*

*Drives Lab-tested Under ILIR Program*

# SIMULINK / STATEFLOW Model

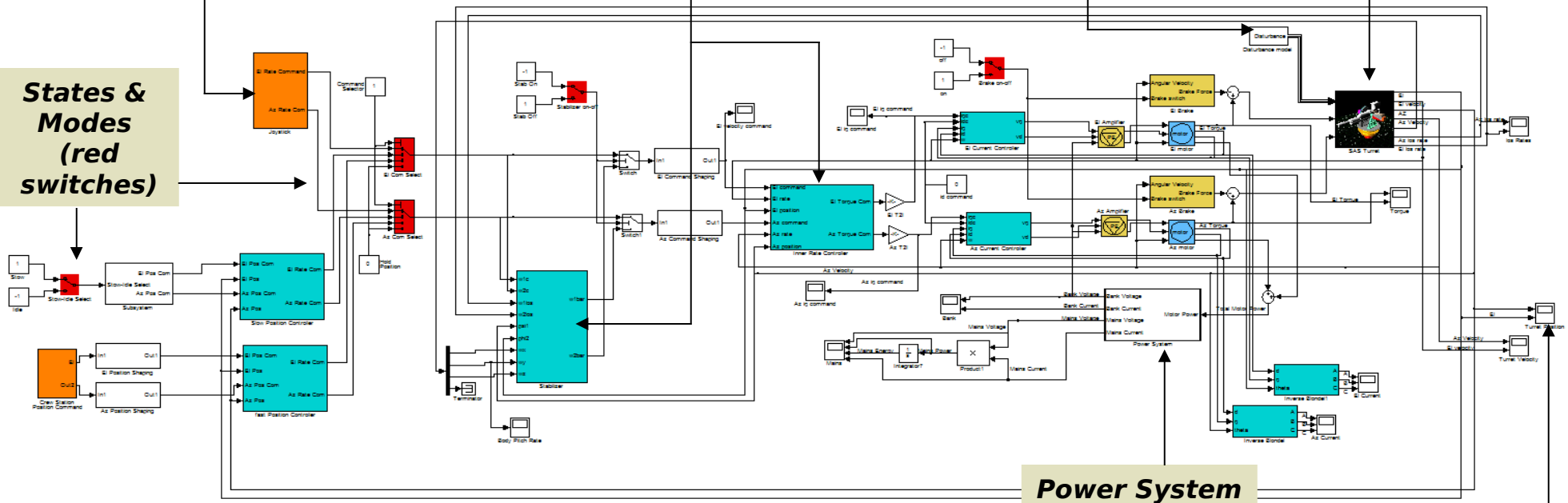
**Displacement and Velocity Commands = f(control Input, platform disturbances, Ballistic solution)**

**States & Modes (red switches)**

**Rate and Stab Controllers**

**Disturbances from Platform**

**Solid Model**



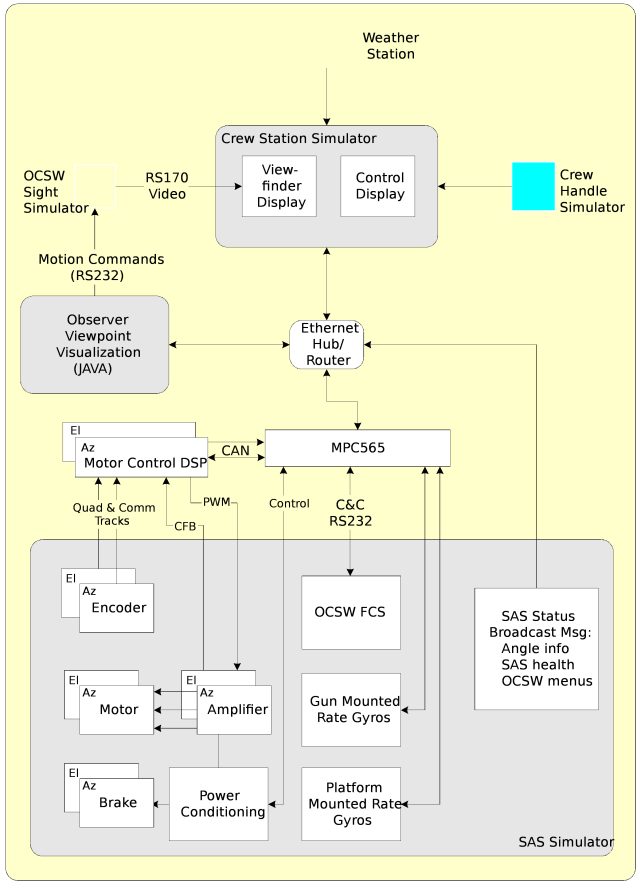
**Power System Model**

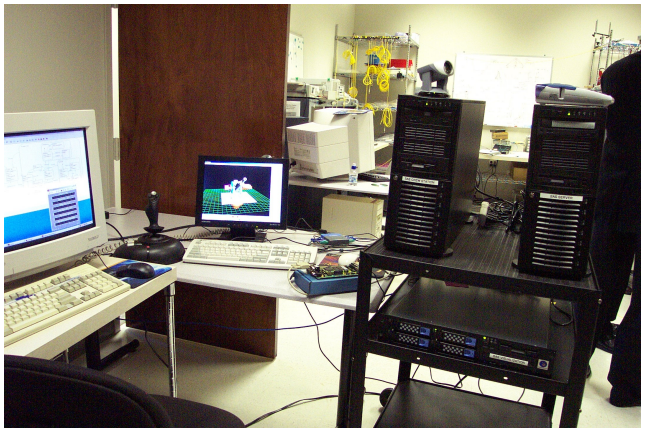
**Outputs**

*Updated control model and integrated states and modes via Stateflow*

Source: Techno Sciences, Inc

# Emulator



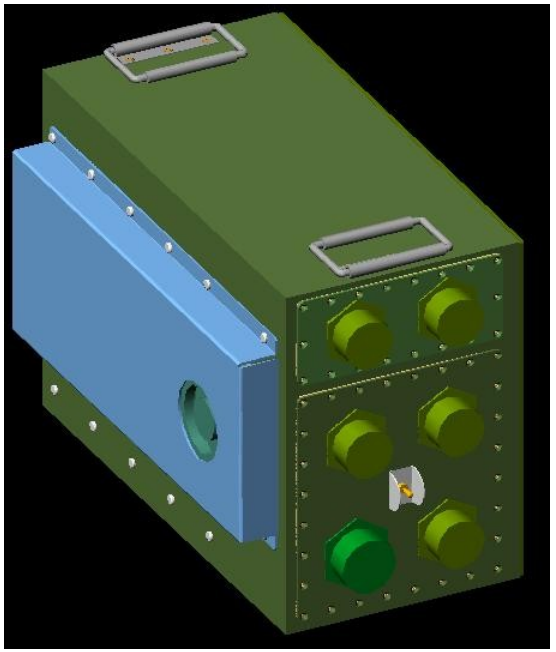



*Source: Techno Sciences, Inc*

*Developed Crew Station Simulation, ACSW Simulation, Interfaces, and Ethernet Interfaces – Will validate with ACSW Fire Control emulator.*

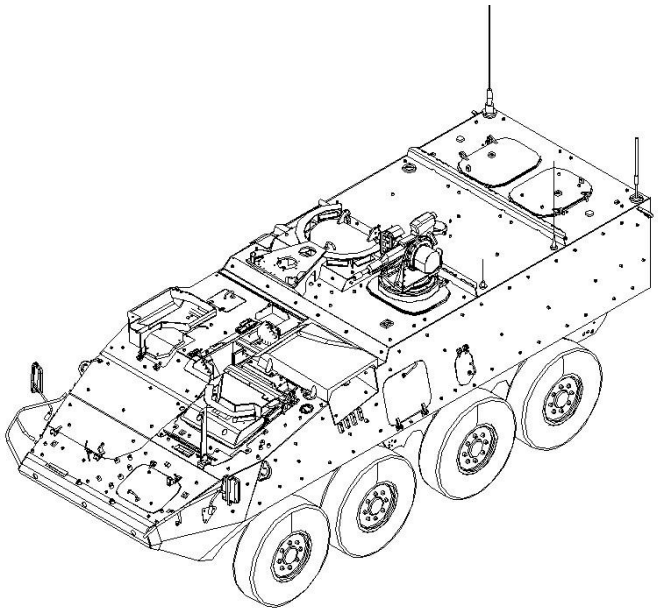
# Electrical Packaging

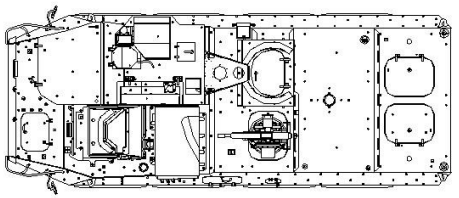
- **Merged power conditioning and control units into single enclosure.**
- **Major components**
  - **Azimuth and elevation drives (amplifiers)**
  - **Capacitor bank**
  - **Control processor**
  - **Interfaces**
- **Improved thermal management**
  - **Added heat sink and fan to motor and power components**

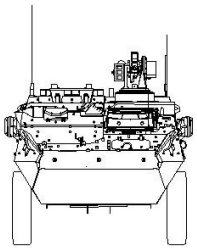


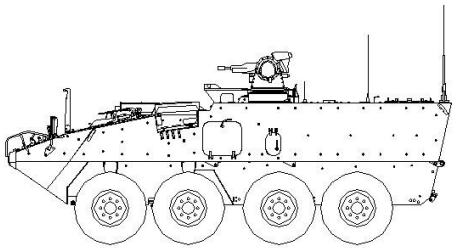
*Source: GD Robotic Systems*

# Stryker Demo Platform



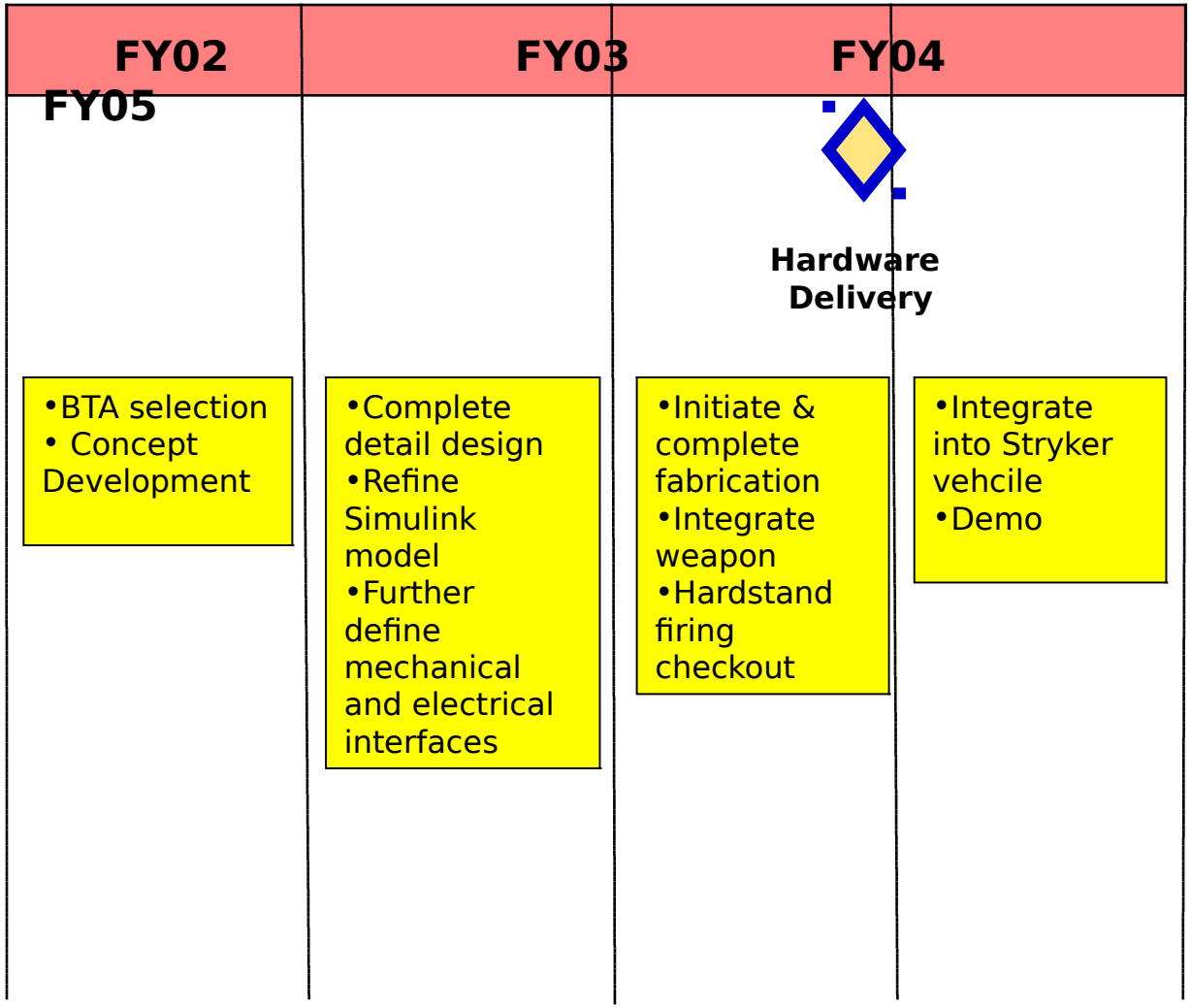






*Source: GD Robotic Systems*

# Program Plan



# Summary

- Initiated fabrication
  - Long-lead items on order
  - Parts in fabrication
  - Physical integration of ACSW
- Updated system model
- Updated system emulator
  - Added crew station simulation
  - Interface with ACSW
  - Validate with ACSW FC emulator
- Planning to demo on Stryker vehicle platform